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**DATA COMPUTER SUPPORT OF SEISMIC DATA
ACTIVITY**

Computer Corporation of America

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DATA COMPUTER SUPPORT OF SEISMIC DATA ACTIVITY

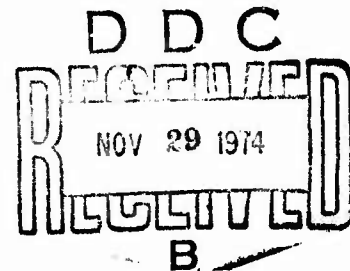
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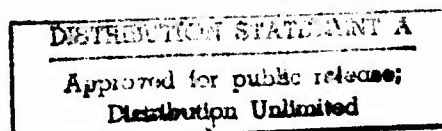
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1. Overview

1.1 Project Goals

The purpose of the project is to support the ARPA-NMRO Seismic Data Activity by providing data storage and retrieval services. The Arpanet will be used as the communication channel. As part of the service, seismic data will be (a) collected from the Arpanet; (b) stored; and (c) made available to computers on the Arpanet in a convenient and timely manner. These services will represent a special application of the Arpanet Datacomputer implemented by CCA under Contract No. MDA903-74-C-0225.

The Datacomputer will require no special programming for the seismic data application, beyond that which has already been planned for the time period being considered. However, the amount of seismic data to be kept on-line necessitates the addition of a tertiary storage mass memory. Ampex Terabit Memory System (TBM) with a capacity of almost two hundred billion bits will be installed at CCA in 1975.

Also needed for this project is a small Seismic Input Processor (SIP). The SIP will collect data over the network on a round-the-clock basis. It will reformat the data and buffer it. At regular intervals, the SIP will generate a datalanguage update request and burst the data to the datacomputer via the TIP (see Fig. 1).

1.2 Status of the Project

The initial activity on the project has been in two areas: hardware acquisition and coordination with the seismic community.

Contract negotiations are under way with Ampex Corporation for the purchase of a TBM Memory System, to be incorporated into the Datacomputer. The initial configuration of the TBM

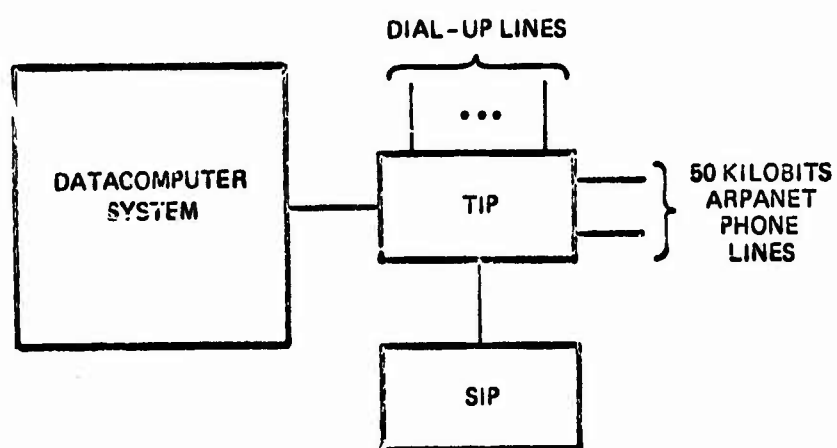


Figure 1 - CCA Installation

is one transport driver, two dual transport modules, one data channel, and a Communications and Control System (CCS). The CCS contains a Storage Control Processor and a Channel Interface Unit. Delivery of the TBM Memory System is expected to be in July 1975.

The SIP hardware will consist of a DEC PDP-11 with 28K core, two RP01 disks with a storage capacity of 176 million bytes, and an Arpanet interface. Delivery is expected to be in December 1974.

CCA has worked closely with the seismic community to determine requirements for data storage and retrieval services. Efforts have been undertaken to specify suitable file formats for storage of the seismic data. These formats reflect the way in which the data is collected, the way in which it will be used, and the most efficient ways of using the Datacomputer hardware and software.

Efforts are also under way to determine the specification of the CCP-SIP protocol. This is a special-purpose protocol that will allow for faster transmission of real-time data than the standard host-host protocol.

2. TBM

In order to satisfy the requirement for a large, on-line seismic database, an Ampex Terabit Memory System (TBM) will be installed at CCA as a part of the Datacomputer system. The TBM consists of two parts: a Data Storage Section (DSS), which is the repository of all data stored within the TBM, and a Communications and Control System (CCS), which provides message and data interfaces between the PDP-10 and the TBM. The DSS is described in Appendix E of our proposal, "Datacomputer Support of Seismic Data Activity", submitted August 13, 1973.

The CCS incorporates new technical concepts regarding the TBM/PDP-10 interface. The CCS uses a PDP-11 and special interface hardware to provide interfacing and control functions for the TBM. The CCS interprets and executes instructions received from the PDP-10 via an SA-10 IBM-compatible channel, as well as commands typed at the CCS operating console. Much of the overhead involved in controlling the TBM is in the PDP-11 rather than the PDP-10, thus freeing PDP-10 CPU resources.

3. SIP

Seismic data will be collected from the Arpanet and buffered by a small Seismic Input Processor (SIP) before retransmission to the Datacomputer. The SIP will have two 3330-type spindles, which allow for 24-hour buffering of a 15 kb/second data stream. This will ease requirements for both the Datacomputer and the Central Communications Processor (CCP) at SDAC.

The SIP is a host on CCA's IMP. The SIP communicates with the Datacomputer as any other host would, that is, using data-language, network data connections, and the standard Arpanet host-host protocol. Transfer rates are much higher than normal network communication, however, since no phone lines are involved.

The SIP communicates with the CCP at SDAC using a data transfer protocol which is specially developed for this purpose. The protocol has mechanisms for describing the data logically, for detecting data link outages and reinitializing the data link, for checksumming the data, and the like. CCA has coordinated with BBN in specifying the CCP-SIP protocol which is described in "Proposed Communication Protocol Between the CCP and SIP", by R.T. Gudz of BBN.

4. Coordination with the Seismic Community

Although no special Datacomputer programming is required for the seismic application, the amount of data to be collected necessitates that the data be handled as efficiently as possible if the application is to be feasible. Design of the application requires a thorough understanding of how the data is to be collected and how it is to be used. Towards this end, CCA has worked closely with VSC, SDAC, BBN and others to identify the data storage and retrieval requirements for the seismic application.

Work continues towards specifying the file formats for the seismic data. Figure 2 contains a sample datalanguage description for a file containing raw waveforms, which account for the bulk of the data. One file contains a day's worth of data, which is a size that is convenient both for the Datacomputer and for a seismologist who is analyzing the data. The data is organized first by site and then by time. Preliminary versions of the formats for the other seismic files (e.g., waveform summary and status file, preliminary event data file, final event data file) are described in "SDAC On-Line Processing with Datacomputer Proposal", Emily McCoy, SDAC.

```

CREATE ALPF.DDYY FILE STRUCT
  ALPA LIST (86400) /* # SECONDS PER DAY*/
    SAMPLE STRUCT
      SEQNO BYTE V = I
      TIME BYTE (1), B=32
      TIMESERIES LIST (51) /* # CHANNELS */
      DATA BYTE (1), B=16
    END

  ILPA LIST (86400) /* # SECONDS PER DAY*/
    SAMPLE STRUCT
      SEQNO BYTE V = I
      TIME BYTE (1), B=32
      TIMESERIES LIST (57) /* # CHANNELS */
      DATA BYTE (1), B=16
    END

  KSRS LIST (86400) /* # SECONDS PER DAY*/
    SAMPLE STRUCT
      SEQNO BYTE V = I
      TIME BYTE (1), B=32
      TIMESERIES LIST (21) /* # CHANNELS */
      DATA BYTE (1) B=16
    END

  SITEII LIST (86400) /* # SECONDS PER DAY*/
    SAMPLE STRUCT
      SEQNO BYTE V = I
      TIME BYTE (1), B=32
      TIMESERIES LIST (21) /* # CHANNELS */
      DATA BYTE (1), B=16
    END

  LASA LIST (86400) /* # SECONDS PER DAY*/
    SAMPLE STRUCT
      SEQNO BYTE V = I
      TIME BYTE (1), B=32
      TIMESERIES LIST (30) /* # CHANNELS */
      DATA BYTE (1), B=16
    END

  NORSAR LIST (86400) /* # SECONDS PER DAY*/
    SAMPLE STRUCT
      SEQNO BYTE V = I
      TIME BYTE (1), B=32
      TIMESERIES LIST (56) /* # CHANNELS */
      DATA BYTE (1), B=16
    END
END;

```

Figure 2 - Sample Datalanguage Description of Seismic File